

REMARKS

This application was originally filed with 58 claims. Claims 1-37 and 53-58 were previously cancelled. Claims 46-52 were withdrawn from further consideration pending possible allowance of a generic claim. Claim 59 was previously added, to be examined after allowance of claims drawn to the elected species (Claims 38-45). Claims 38-45 have been amended.

Claim Rejections - 35 U.S.C. § 102(b)

Claims 38-40 and 42 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Henderson, U.S. Patent No. 4,062,489 (“Henderson”). In response, Applicant has amended Claims 38-40 and 42 to clarify that Claims 38-40 and 42 are drawn to an improvement to a direct exchange (“DX”) geothermal heat pump system. Henderson discloses a water-source heat pump, not a DX system. This is an important distinction that Applicant respectfully submits was not fully considered when applying the teachings of Henderson to the rejected claims.

Water-source heat pumps always require circulating water, circulated via a water pump, to be used as a heat exchange medium. DX heat pumps do not require circulating water and do not require a water pump. Water-source systems have three heat exchange steps (ground to water to refrigerant to air). DX systems have two heat exchange steps (ground to refrigerant to air), all of which is well understood by those skilled in the art. While both water-source and DX system heat pumps ultimately utilize ground heat as a primary heat source/heat sink, the technologies are quite different. For example: a DX system effects a sub-surface

fluid phase change, while a water-source system does not; a DX system operates at 20 to 100 degree F temperature differentials between the ground and the refrigerant, while a water-source system typically operates with only a 10 to 15 degree F temperature differential between the ground and the water (with an extra heat exchange step required to the refrigerant).

Henderson transfers heat from a solar collector (10) (mounted above the heat storage facility) to a water containment tank (20). A conventional water-source water to refrigerant heat exchanger (45) is then used to transfer the heat within water contained in an above-ground holding tank to the interior air. Henderson simply expands the water holding tank capacity by transferring any extra heat into the ground for storage, via water circulating tubes (65, 66).

Henderson's system requires a water circulating pump (50) to transfer solar heat into the water containment tank (20), whereas Applicant's invention requires neither a water containment tank nor a water pump for such a purpose. Henderson's invention, solely dealing with a water to refrigerant heat pump system application, requires a water circulating pump (61) to transfer excess solar heat into the ground, whereas Applicant's subject invention, solely dealing with a DX heat pump system application, does not. Avoiding the necessity for even one water circulating pump is a significant improvement in a field where the ability to maximize energy efficiency is a primary goal. Applicant teaches how to avoid both of Henderson's water circulating pumps, shown as items 50 and 61 in Fig. 1. This is

accomplished by utilizing a DX system heat exchange design, instead of a circulated water-to-refrigerant heat exchange design, as taught by Henderson.

On page 3 of the Office Action, the Examiner characterizes certain language in Claim 39 as being a functional recitation of heat exchange means. This would be correct when applied to a water-source system application, since the introduction of solar heat into the water circulating transport tubing at any point prior to entry into the ground would be relatively harmless, with the ground simply being used as an expanded heat storage facility for the primary water containment tank as in Henderson. This characterization is incorrect when applied to a DX system. For example, the introduction of solar heat at any point in a water-source system utilizing a water storage tank is relatively inconsequential, as any extra heat unused by the water-source heat pump would simply be eventually circulated into the ground, and, since water is not a phase-change fluid at water-source heat pump operational temperatures, any extra solar heat placed into the circulating would only raise the temperature of the water. However, in a DX system application, the introduction of supplemental solar heat at a point in the refrigerant transport tubing at any other point than prior to the refrigerant's entry into the ground could easily create too high a head pressure and result in system shut-down via the system's high pressure cut-off switch, rendering the heating system useless, and/or could pre-maturely phase change the necessary liquid phase refrigerant into a vapor, rendering the system's heating expansion device ineffective. Such DX system related issues would not be readily apparent to one skilled in the art of

water-source heat pumps. Accordingly, Applicant respectfully submits that Claims 38-40 and 42, as amended, are not anticipated by Henderson and should be allowed.

Claim Rejections - 35 U.S.C. § 103

Claims 41 has been rejected under 35 U.S.C. § 103 as being unpatentable over Henderson. Claim 44 has been rejected as being unpatentable over Henderson in view of Marakusa. Claims 41 and 44 are dependent from Claim 38. Claim 38 has been amended to more clearly define the invention as pertaining to a DX geothermal heat exchange system, not a water source system. Neither Henderson nor Marakusa suggest combining a supplemental solar heating system with a DX geothermal heat pump system. The arguments provided above about the distinctions between the claimed invention and Henderson apply here as well. Therefore, Claims 41 and 44 should be allowable.

Allowable Subject Matter

The Examiner has note that Claims 43 and 45 would be allowable if rewritten in independent form including all limitations of the base claim and any intervening claims. Accordingly, Claims 43 and 45 have each been rewritten as independent claims, including the limitations of original Claim 38. Therefore, Claims 43 and 45 should now be allowable.

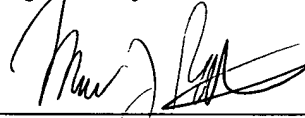
Applicant has commented on some of the distinctions between the cited references and the claims to facilitate a better understanding of the present invention. This discussion is not exhaustive of the facets of the invention, and Applicant hereby reserves the right to present additional distinctions as

appropriate. Furthermore, while these remarks may employ shortened, more specific, or variant descriptions of some of the claim language, Applicant respectfully notes that these remarks are not to be used to create implied limitations in the claims and only the actual wording of the claims should be considered against these references.

Pursuant to 37 C.F.R. § 1.136(a), Applicant herewith petitions the Commissioner to extend the time for responding to the November 8, 2004, Office Action from February 8, 2005 to March 8, 2005. Applicant encloses herewith a check in the amount of \$60.00 made payable to the Director of the USPTO for the petition fee.

The Commissioner is authorized to charge any deficiency or credit any overpayment associated with the filing of this Response to Deposit Account 23-0035.

Respectfully submitted,



Mark J. Patterson
Registration No. 30,412
WADDEY & PATTERSON
A Professional Corporation
Customer No. 23456

ATTORNEY FOR APPLICANT



CERTIFICATE OF FIRST CLASS MAILING

I hereby certify that this Response and Amendment and a check in the amount of \$60.00 are being deposited with the United States Postal Service as first class mail in an envelope addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

on March 8, 2005.

Mark J. Patterson

Signature

Registration Number 30,412

Date